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# THE IDENTITY OF VARISCITE AND PEGANITE AND THE DIMORPHOUS FORM, METAVARISCITE[1]

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Some years ago while collecting data for a set of mineral tables[2] the very close similarity of the optical properties of peganite and lucinite was noticed and the authors of this paper discussed the similarity but decided that the difference in composition between the two seemed too great to justify the conclusion that they were identical. Attention was called to the optical similarity[3] in the hope that further work would be done.

In 1918, Moschetti[4] published a new analysis of peganite on material that appeared to be identical with the original peganite described by Breithaupt, and showed that it had a composition identical with that assigned to variscite, and concluded that peganite and variscite are identical. Optically, peganite had been shown to be identical with lucinite while the "variscite" from Lucin, Utah is optically different. It therefore seemed desirable to study this group of minerals further.

A large number of specimens of these minerals was accordingly secured, attempting in particular to get reliably labelled material from the type localities. Specimens were kindly furnished us by Harvard University, Yale University, Johns Hopkins University,

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[1] Published with the permission of the Director of the United States Geological Survey.

[2] Larsen, E. S. Microscopic determination of the non-opaque minerals. *U. S Geol. Survey Bull.* **679**, 1921.

[3] Larsen, E. S. *Loc. cit.* p. 102.

[4] Moschetti, Lorenzo. Sulla probabile identità della peganite con la variscite. *Reale Accademia delle Scienze di Torino,* **LIII**, 1918.

The University of California, The United States National Museum, The American Museum of Natural History, The Academy of Natural Science of Philadelphia, and Colonel Roebling, to all of whom we express our thanks.

In all, thirty specimens were obtained and their optical properties determined. Seven were labelled peganite, Striegis, Saxony, the original locality for peganite; two were labelled peganite from Arkansas; two were type specimens of lucinite from Utah of somewhat different texture; two were "variscite" from Lucin, Utah (now called metavariscite); and seventeen were labelled variscite from various localities, including four specimens from Messbach, the original locality.

The optical data are shown in tables I to III. All the material labelled peganite, the lucinite, and all specimens labelled variscite, except those from Lucin, Utah, are optically negative, and have a moderately large (50-60°) axial angle. The birefringence measurements vary from 0.020 to 0.030 but the two extreme measurements

## TABLE I

### OPTICAL PROPERTIES OF VARISCITE
### (Coarsely crystalline varieties)

All are optically −; $2V$ moderately large; Elongation +; Extinction ||.

| | Striegis, Saxony | Striegis, Saxony | Striegis, Saxony | Striegis, Saxony | Arkansas[1] | Striegis, Saxony | Messbach,[2] Saxony | Lucinite[3] Lucin, Utah | Striegis, Saxony |
|---|---|---|---|---|---|---|---|---|---|
| $\alpha$ | 1.554 | 1.556 | 1.555 | 1.562 | 1.562 | 1.562 | 1.564 | 1.563 | 1.568 |
| $\beta$ | 1.571 | 1.573 | 1.576 | 1.580 | 1.583 | 1.583 | 1.584 | 1.585 | 1.588 |
| $\gamma$ | 1.576 | 1.580 | 1.583 | 1.586 | 1.590 | 1.587 | 1.592 | 1.592 | 1.594 |

Note: The Arkansas mineral appears to be very uniform while specimens from Striegis vary.

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[1] Average for 7 specimens from different sources. Maximum divergence ±0.001. Five labelled variscite, two labelled peganite.

[2] Looks like "peganite" from Striegis.

[3] Type lucinite.

## TABLE II

## OPTICAL PROPERTIES OF VARISCITE
(Finely crystalline varieties)

All are optically −; $2V$ moderately large.

| | Messbach, Saxony | Columbus, Nevada | Lewistown[1] Utah | Mercur, Utah | Striegis,[2] Saxony | Messbach, Saxony | Messbach,[3] Saxony | Tooele, Utah | Manhattan, Nevada | near Tonopah Nevada | Lucin,[4] Utah | Lehigh, Utah | Arkansas |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\alpha$ | 1.550 | 1.555 | 1.569 | 1.570 | | | | | | | | | |
| $\beta$ | 1.565 | 1.580 | 1.585 | 1.589 | 1.555[a] | 1.554[a] | 1.565[a] | 1.565[a] | 1.569[a] | 1.570[a] | 1.580[a] | 1.582[a] | |
| $\gamma$ | 1.570 | 1.585 | 1.593 | 1.595 | | | | | | | | | 1.594 |

[a] Mean index of refraction.

[1] Rhombic plates with $Z$ bisecting the acute angle.

[2] Coarser part has a higher index of refraction.

[3] Coarser fibers have $\gamma = 1.580$.

[4] Type lucinite appears to be derived from metavariscite.

## TABLE III

## OPTICAL PROPERTIES OF METAVARISCITE

Only material from Lucin, Utah agreed with this.
Optically +; $2V = 55°$; $\rho < \nu$ perceptible.
$Y$ is normal to the flat face, $X$ is parallel to the length.

| | Coarsely crystalline | Small grains |
|---|---|---|
| $\alpha$ | 1.551 | 1.551 |
| $\beta$ | 1.558 | 1.561 |
| $\gamma$ | 1.582 | 1.585 |

were made on very finely crystalline material and the probable error is ±0.005. For the better measurements $\gamma - \alpha$ is about 0.026, nearly within the limit of probable error. The indices of refraction vary considerably as measurements of $\beta$ ranged from 1.565 to

1.589, with a probable error of ±0.003. However, this is no greater than is common in minerals with some variation in composition and it may be due to replacement of a part of the aluminum by iron, chromium, or vanadium, or by a variation in the water content. The large amount of water lost by the Arkansas mineral below 110° makes a variable water content probable. As explained below this mineral will now be called variscite.

The mineral hitherto called variscite from Lucin, Utah, is optically different from all other variscites, peganites, and lucinite, and having the same chemical composition is now called *metavariscite.* It is optically positive, has an axial angle of 55°, and a birefringence of about 0.032. Its index of refraction ($\beta$) is 1.558, somewhat lower than that of the variscites, but the mean index of refraction is near that of the lowest values for variscite.

These data confirm the conclusion of Moschetti that peganite and variscite are identical and they show that lucinite is also identical with these but that the mineral from Lucin, Utah, previously described as variscite by Schaller, is a different species. Crystallographical measurements verify these relationships, the values of the interfacial angles of metavariscite (formerly called variscite) from Lucin, Utah, and of variscite (formerly called lucinite) from the same locality, being definitely shown to be different.[5]

Breithaupt proposed the name peganite for the Striegis mineral in 1830 but the analysis on which the description was based was so poor that in 1837 he proposed the name variscite on the basis of a better analysis for the Messbach mineral. The latter analysis and description were much better hence nearly all later finds of the mineral have been called variscite and that name is well established both in scientific mineralogy and in the gem trade. We believe that less confusion will result from retaining the name variscite for the much more common and abundant species and discarding the names peganite and lucinite, and such nomenclature is therefore proposed.

The following new analysis of variscite from Arkansas, made by Earl V. Shannon, shows a close similarity to the theoretical composition.

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[5] Schaller, W. T. Mineralogic Notes, Series 3, *Bull.* **610**, *U. S. Geological Survey*, p. 65, (1916).

ARKANSAS VARISCITE

| | | Analysis | Recalc. | | Theory |
|---|---|---|---|---|---|
| | | | | | ($Al_2O_3.P_2O_5.4H_2O$) |
| Insoluble | $SiO_2$ | 6.40 | | | |
| | $Fe_2O_3$, etc. | .10 | | | |
| $Al_2O_3$ | | 27.34 | 29.16 | 32.88 | 32.30 |
| $Fe_2O_3$ | | 2.20 | 2.33 | | |
| CaO | | 0.43 | 0.46 | | |
| MgO | | 0.87 | 0.93 | | |
| $P_2O_5$ | | 41.20 | 43.79 | 43.79 | 44.90 |
| $H_2O-110$ | | 7.00 | 7.44 | 23.33 | 22.80 |
| $H_2O+110$ | | 14.95 | 15.89 | | |
| | | 100.49 | 100.00 | 100.00 | 100.00 |

CONCLUSION. The tabular and prismatic crystals from Lucin, Utah, originally described[6] as variscite, are different from all other specimens labelled variscite or peganite, and are now called *metavariscite.*

The crystallographical constants of metavariscite are: Orthorhombic, $a:b:c=0.8944:1:1.0919$. $p_0=1.2208$. Thirteen forms known: *b* (010), *a* (100), *l* (130), *j* (250), *d* (120), *h* (340), *m* (110), *q* (210), *f* (520), *e* (012), *g* (032), *t* (102), *p* (111). The form *c* (001) formerly added, has to be left out as the material from Arkansas on which it was determined is not metavariscite.

Optically metavariscite is positive, has an axial angle of about 55°, $\rho<\nu$ is perceptible. $Y$ is normal to the flat face and $X$ is parallel to the length. $\alpha=1.551$, $\beta=1.558$, $\gamma=1.582$; $\gamma-\alpha=0.031$. Metavariscite has been found only at Lucin, Utah, where it appears to alter to finely crystalline variscite. It has the same composition as variscite (=peganite), namely $Al_2O_3.P_2O_5.4H_2O$. An analysis on pure material is given in the literature cited (p. 64). Density 2.54.

All other minerals of this same composition belong to the species variscite, as now defined, and includes all minerals formerly called variscite (with the one exception from Lucin, Utah), peganite, and lucinite (which name is now to be discarded). The data given[7] for lucinite are therefore to be applied to the mineral, now to be called variscite.

[6] Schaller, W. T. Crystallized variscite from Utah, Mineralogical Notes, Series 2, *Bull.* **509,** *U. S. Geological Survey,* 1912, pp. 48-65; and The crystallography of variscite, Mineralogic Notes, Series 3, **1916**, pp. 69-80.

[7] Schaller, W. T. Lucinite, a new mineral; a dimorphous form of variscite, Mineralogic Notes, Series 3, *Bull.* **610,** *U. S. Geological Survey,* pp. 56-68, (1916).

The crystallographical constants of variscite are then: Orthorhombic, $a:b:c = 0.8729:1:0.9788$. $p_0 = 1.1225$. Habit octahedral. Eight forms: *c* (001), *a* (100), *d* (120), *e* (012), *r* (113), *i* (112), *p* (111), *s* (121).

The optical properties of variscite from Arkansas are: optically negative, $2V$ moderately large, $Z$ is parallel to the elongation. $\alpha = 1.562$, $\beta = 1.583$, $\gamma = 1.590$, $\gamma - \alpha = 0.028$. The intermediate index of refraction, $\beta$, of specimens from other localities varies from 1.560 to 1.588 and the birefringence from 0.020 to 0.030. The axial angle of the variscite from Striegis is 53°, that from Lucin is 57°. The dispersion of the optic axis is perceptible and $\rho < \nu$. Variscite has the same composition as metavariscite, $Al_2O_3.P_2O_5.4H_2O$, as evidenced by analyses of material from Utah (lucinite), Arkansas, Messbach, Striegis, Sardinia, etc. Its density is nearly the same as that of metavariscite.

## RADIO-DETECTOR MINERALS

Edgar T. Wherry, *Washington, D. C.*

In the paper by Roberts and Adams[1] on radio-detector minerals only thirteen species were listed. The writer has tested a considerable number of additional ones, using a copper "cat's whisker" and a simple crystal set, and has found about 75 to possess detector properties. These are listed in table 1, arranged in the order of their chief metallic constituents in the periodic system. As is well known, radio-detector properties are not constant for a given mineral, but vary from one specimen to another, and even from one form to another on a single crystal; in general, the maximum effect obtained with each mineral is here recorded.

The relation of detector properties to the composition of the minerals is very interesting. In most cases sulfides detect better than oxides, but occasionally the oxides may be superior, as with manganese and zinc. Replacement of sulfur by selenium may improve the detector properties, as in argentite-aguilarite-naumannite, but the reverse holds in stromeyerite-eucairite. The effects of introducing tellurium or arsenic are likewise variable.

On comparing the list of detecting minerals with the table of low-voltage conductors prepared by Davy and Farnham,[2] a certain amount of correlation appears. With few exceptions, species which might be expected to detect, but prove not to do so, were found by them to be non-conductors. Tetrahedrite occupies an anomalous position, being classed as non-conducting, yet detecting well; but the gradation into tennantite is a sufficient explanation. In general the better detectors are found in the list of moderate conductors, ranging from pyrite with about 5% conductivity to galena with 80% (compared with metallic copper as standard).

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[1] *Am. Min.*, **7**, 131-136, (1922).

[2] Microscopic examination of the ore minerals. N. Y., 1920, p. 123.

### TABLE 1

### RADIO-DETECTOR PROPERTIES OF MINERALS

| ELEMENTS | GOOD | | FAIR | | POOR | |
|---|---|---|---|---|---|---|
| C | | | graphite | $C$ | anthracite | $C_xH_y$ |
| Si | (artificial) | $Si$ | carborundum | $SiC$ | | |
| Ti | | | octahedrite | $TiO_2$ | (artificial) | $Ti$ |
| Ti | | | brookite | $TiO_2$ | ilmenite | $FeTiO_3$ |
| Mo | | | molybdenite | $MoS_2$ | | |
| Mn | | | pyrolusite | $MnO_2$ | psilomelane | $MnOOH+X$ |
| Fe | pyrite, impure | $FeS_2+X$ | pyrrhotite | $FeS_{1-1.2}$ | (artificial) | $Fe$ |
| Fe | | | loellingite | $FeAs_2$ | arsenopyrite | $FeSAs$ |
| Fe | | | hematite | $Fe_2O_3$ | magnetite | $Fe_3O_4$ |
| Fe+Ni | | | taenite | $Fe, Ni$ | pentlandite | $(Fe, Ni)S$ |
| Fe+Cu | tennantite* | $Fe_2Cu_{10}As_4S_{13}$ | chalcopyrite* | $Fe\ CuS_2$ | bornite | $Fe\ Cu_5S_4$ |
| Fe+Cu | | | tetrahedrite* | $Fe_2Cu_{10}Sb_4S_{13}$ | stannite* | $FeCu_2SnS_4$ |
| Co | | | linneite | $Co_3S_4$ | smaltite, safflorite | $CoAs_2$ |
| Co | | | glaucodotite | $CoSAs$ | cobaltite* | $CoSAs$ |
| Ni | | | polydymite | $Ni_3S_4$ | (artificial) | $Ni$ |
| Ni | | | rammelsbergite | $NiAs_2$ | ullmannite* | $NiSSb$ |
| Cu | enargite | $Cu_3AsS_4$ | chalcocite | $Cu_2S$ | domeykite | $Cu_3As$ |
| Cu | | | berzelianite | $Cu_2Se$ | covellite | $CuS$ |
| Cu | | | famatinite | $Cu_3SbS_4$ | rickardite | $Cu_4Te_3$ |
| Cu+Ag | | | stromeyerite | $CuAgS$ | eucairite | $CuAgSe$ |
| Cu+Pb | | | | | aikinite | $CuPbBiS_3$ |
| Ag | | | aguilarite | $Ag_2(S, Se)$ | argentite | $Ag_2S$ |
| Ag | | | naumannite | $Ag_2Se$ | empressite | $AgTe$ |
| Ag | | | hessite | $Ag_2Te$ | argyrodite* | $Ag_8GeS_6$ |
| Ag+Au | | | sylvanite | $AgAuTe_4$ | petzite | $Ag_3AuTe_2$ |
| Ag+Pb | | | | | alaskaite | $Ag_2PbBi_4S_8$ |
| Au | | | calaverite | $AuTe_2$ | | |
| Au+Pb | | | | | nagyagite | $AuPb_6(Sb,Te)_4S_9$ |
| Zn | zinc oxide, art.* | $ZnO$ | zincite* | $(Zn, Mn)O$ | | |
| Hg | | | tiemannite* | $HgSe$ | metacinnabarite* | $HgS$ |
| Hg | | | coloradoite | $HgTe$ | onofrite* | $Hg(S, Se)$ |
| Pb | galena, impure | $PbS+X$ | clausthalite | $PbSe$ | altaite | $PbTe$ |
| Pb | | | chiviatite | $PbBi_4S_7$ | bismutoplagionite | $Pb_5Bi_8S_{17}$ |
| Pb | | | guitermanite | $Pb_3As_2S_6$ | galenobismutite | $PbBi_2S_4$ |
| Pb | | | beegerite | $Pb_6Bi_2S_9$ | lilianite | $Pb_3Bi_2S_6$ |
| As | | | | | arsenic | $As$ |
| Sb | | | | | antimony | $Sb$ |
| Bi | | | guanajuatite | $Bi_2SSe_2$ | bismuth | $Bi$ |
| Bi | | | | | tetradymite | $Bi_2STe_2$ |
| Te | | | | | tellurium | $Te$ |

Noteworthy non-detectors (might be expected to detect, but do not)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ti | rutile | $TiO_2$ | Mn | alabandite | MnS | Zn+Fe | marmatite | (Zn, Fe)S |
| Zr | zircon | $ZrSiO_4$ | Fe | troilite | FeS | Cd | greenockite | CdS |
| Cb+Fe | columbite | $FeCb_2O_6$ | Fe+Zn | franklinite | $ZnFe_2O_4$ | Hg | cinnabarite | HgS |
| Ta+Fe | tantalite | $FeTa_2O_6$ | Ni | millerite | NiS | Sn | cassiterite | $SnO_2$ |
| Cr+Fe | chromite | $FeCr_2O_4$ | Cu | cuprite | $Cu_2O$ | Sb | stibnite | $Sb_2S_3$ |
| W+Fe | ferberite | $FeWO_4$ | Cu, etc. | sulfo-salts, except as noted above. | | Bi | bismuthinite | $Bi_2S_3$ |
| U+X | uraninite | $UO_2$+X | | | | Se | selenium, cryst. | Se |

* Possessing polar (hemimorphic) axes.

In the paper cited Roberts and Adams suggested that the sensitive spots of radio-detecting crystals are points where layers composed wholly of one kind of atom occur; and in accordance with this theory, the spots on galena would be octahedral planes, bevelling the corners of the usual cubic cleavage. The octahedrally cleavable galena (containing bismuth as an impurity) mentioned in the mineralogy texts, should, then, be an unusually good detector, and small samples of this material[3] were obtained through the kindness of Professor Ford of Yale University and Professor Palache of Harvard University. It proved, however, not to detect at all, indicating the insufficiency of the simple one-kind-of-atom-layer theory.

A modification of that theory is accordingly here suggested, namely, that the layers (or groups) of like atoms must exhibit one-sided attraction for assemblages of electrons. There are two cases to be considered, the one in which the purer the crystal the better the results, as exemplified by zincite, the other in which the radio-detector properties are clearly connected with the presence of definite impurities, as in galena, pyrite,[4] and apparently most of the other minerals in the table.

In zincite the layers of one kind of atom are arranged perpendicular to the singular axis (crystallographic axis *c*) in such a manner that this axis is polar (or as it is often rather inaptly termed, hemimorphic). Perhaps the corresponding one-sided attractive force holding the electrons to such an atom layer permits these electrons to move more readily in one direction than in the other and so renders the substance a radio-detector. About ten other minerals, starred in table 1, also show polar axes, and may owe their detector properties to this structural peculiarity.

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[3] Dr. E. G. Zies of the Geophysical Laboratory kindly tested some fragments from Lancaster County, Pa., with the spectroscope, and found several per cent of bismuth to be present, but no other impurities in more than slight traces.

[4] Qualitative tests of unusually good pyrite from Leadville, Colo., indicated the presence of a little arsenic and selenium (?), although to which of these, if either, the detector properties are to be assigned can not be decided.

That the presence of certain impurities, with the corresponding irregularity in the crystal structure, increases the radio-detector properties of many minerals is evident. The relatively pure galenas from the Joplin district and elsewhere in the Mississippi Basin, for instance, are poor, while on the other hand the argentiferous galenas from many of the Rocky Mountain deposits are excellent detectors. Examination of the cleavages of the latter specimens with a lens almost always shows the existence of a wavy-striated surface, indicating some distortion in the crystal structure, no doubt connected with the presence of the silver compound. It seems probable that such distortion of the layers of atoms may shift electrons out of their normal positions, so that groups of them are held by one-sided attractive forces, and may thus give rise to the radio-detector properties exhibited.

SUMMARY. About 75 minerals which have been found to possess more or less radio-detector properties are tabulated with respect to their compositions. Sulfides are usually better than oxides of the same metals, selenides sometimes better than sulfides. Most of these minerals are moderate conductors of low-voltage electricity. The theory of Roberts and Adams that sensitive spots on crystals are merely layers composed wholly of one kind of atom is shown to be insufficient, and a modification is suggested. In some cases such layers are perpendicular to "hemimorphic" or polar axes, and the detector properties may be due to the corresponding one-sided attraction of the electron layers. In most minerals the presence of certain impurities improves the detector properties, which may be due to resulting irregularities in the crystal structure, with corresponding one-sided attractive forces holding groups of electrons.

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# A REEXAMINATION OF BEAUMONTITE FROM BALTIMORE[1]

EARL V. SHANNON, *U. S. National Museum*

Beaumontite, described as a new mineral from Baltimore in 1839 by Levy and named after Elie de Beaumont,[2] was the subject of vigorous discussion for years thereafter. Alger maintained that the mineral was identical with heulandite crystallographically[3] while Des Cloizeaux reached the same conclusion from an optical examination.[4] G. Rose failed to agree with preceding authors in regarding beaumontite as identical with heulandite. Mallard[5] considered the two as identical from experiments on the effect of heat upon the optical properties while Klein,[6] on the same basis, held a different view. The literature has been previously summarized by Geo. H. Williams[7] who concludes, from crystal measurements made by Burton and Gill, that the crystals agree with heulandite in angle.

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[1] Published by permission of the Secretary of the Smithsonian Institution. This paper is the fourth preliminary paper on subjects of interest developed in the course of an investigation of the minerals of Maryland undertaken in cooperation with the Maryland State Geological Survey.

[2] F. Michel Levy: L'institut, No. 313, p. 455; Berzelius Jahrsbericht, **20**, 217, (1840); London & Edinb. *Phil. Mag.*, **Feb.** 1840.

The only analysis thus far made on the mineral was on a very small sample by Delesse and published by Des Cloizeaux. This was probably made upon material of doubtful purity.

It was deemed desirable that a further examination of this mineral be made to more definitely settle its status and, fortunately, several good specimens were available in the collections of the National Museum.

The mineral occurs as minute crystals, averaging 1 millimeter or less in diameter, disseminated as crusts on other minerals, especially partly altered crystals of "haydenite." The crystals vary in color from colorless to green and pale yellow. When green it is obviously from inclusions of the clayey material which is a common product of the decomposition of the first generation of zeolites, notably haydenite and stilbite, which has been called halloysite. This material will be further investigated and described in a later paper. It turns brown quickly on exposure to air and the yellowish crystals are evidently pigmented by an oxidised form of the same material.

Much of the discrepancy in the measured angles of the mineral has been due to a tendency to parallel growth or curvature of the faces. With a modern 2-circle goniometer it is possible to measure very minute crystals but even these do not give very good signals. A number were measured and all of those seen had the simple habit illustrated in figure 2, in Dana's System. The forms present are *c* (001), *b* (010), *m* (110), *t* (101) and *s* ($\bar{1}01$). The negative dome *s* ($\bar{1}01$) is commonly somewhat larger than the corresponding positive dome *t* (101). The average coordinate angles measured are compared with the corresponding angles of heulandite in the following table:

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[3] F. Alger: *Am. Jour. Sci.*, **46**, 233, (1844).

[4] Des Cloizeaux: Manuel de Mineralogie, **1**, 428, (1862).

[5] *Bull. Soc. Min. France.*, **5**, 260, (1882).

[6] *Zeits. Kryst.*, **9**, 66, (1884).

[7] Minerals occurring in the neighborhood of Baltimore. Johns Hopkins Publication Agency, pp. 10-11, **1887**.

ANGLES OF BEAUMONTITE

| Form | | Symbol | | Quality | Measured | | Calculated | |
|---|---|---|---|---|---|---|---|---|
| No. | Letter | Gdt. | Miller | Description | $\varphi$ | $\rho$ | $\varphi$ | $\rho$ |
| 1. | *c* | 0 | 001 | Fair | 89°48′ | 2°09′ | 90°00′ | 1°25′ |
| 2. | *b* | 0∞ | 010 | Good, usually double | 0°59′ | 90°00′ | 0°00′ | 90°00′ |
| 3. | *m* | ∞ | 110 | Rounded, poor. | 66°46′ | 90°00′ | 68°02′ | 90°00′ |
| 4. | *t* | 10 | 101 | Poor, dull | 89°48′ | 65°06′ | 90°00′ | 65°05′ |
| 5. | *s* | −10 | $\bar{1}01$ | Excellent | $\bar{9}0°00'$ | 64°58′ | $\overline{90}°00'$ | 64°34′ |

The above figures, considering the quality of the crystals, show a fully satisfactory agreement between the angles of beaumontite and those of heulandite.

The crystals split readily along a perfect cleavage parallel to *b* (010). Optically they are biaxial with 2V medium, estimated at 50° and are positive with pronounced dispersion. Complete crystals lying on *b* (010) give approximately parallel extinction but the extinction is undulatory with a confused and ill-defined hour-glass structure. The thin cleavage flakes split from the crystals yield better results with the acute bisectrix perpendicular to the (010) cleavage and the trace of the optical plane approximately parallel to (001). Such sections give extinction up to $5\frac{1}{2}°$ measured against the trace of (001) so that the optical orientation is $X = a$, $Y \wedge C = +5\frac{1}{2}°$, $Z = b$. The refractive indices measured are $\alpha = 1.493$, $\beta = 1.498$, $\gamma = 1.505$. The crystals are distinctly zoned with the exterior layers of higher refractive index. These data are in relative agreement with those given by Larsen for heulandite, differing only in the size of the optical angle and the character of the dispersion, which are doubtless variable in heulandite as recently shown by Ross and the writer on heulandite from Challis, Idaho.

By the use of an electromagnet and heavy solutions a small sample (0.1 gram) was separated for analysis which was pure except for about 1 to 2 per cent of stilbite and 2 per cent of yellowish inclusions of the oxidised "halloysite." Upon analysis this gave the results shown in column 1 of the following table while in column 2 is listed the analysis by Delesse and in column 3 the theoretical composition of heulandite according to Dana.

| | 1. Beaumontite, (Shannon) | 2. Beaumontite, (Delesse) | 3. Heulandite, (Theory) |
|---|---|---|---|
| $SiO_2$ | 56.73 | 64.20 | 59.20 |
| $Al_2O_3$ | 16.96 | 14.10 | 16.80 |
| $Fe_2O_3$ | 2.05 | 1.30 | —— |
| CaO | 4.31 | 4.80 | 9.20 |
| BaO | 0.61 | —— | —— |
| MgO | 1.08 | 1.70 | —— |
| $Na_2O$ | 0.16 | 0.50 | —— |
| $K_2O$ | 3.28 | —— | —— |
| $H_2O+110°C.$ | 12.13 | 13.40 | 14.80 |
| $H_2O-110°C.$ | 3.60 | | |
| Total | 100.91 | 100.00 | 100.00 |

The composition is essentially that of a heulandite in which potash enters to a notable extent.

From the foregoing optical, crystallographic, and chemical evidence, the conclusion of Dana and others that beaumontite is not a distinct mineral but merely a variety of heulandite is abundantly sustained.

## FLUORITE FROM ROCHESTER, NEW YORK

A. C. Hawkins, *University of Rochester*

The Lockport dolomite (Niagara limestone), which underlies Rochester, New York, is at this locality some 170 feet in thickness, and its upper part, known as the Guelph limestone member, was originally composed of coral heads and fragments in a matrix of calcareous mud. The formation is now thoroughly solidified into a firm rock, and the larger coral heads, whose cellular structure has largely broken down, afford circular cavities, often several inches in diameter, in which crystallized minerals have developed. These minerals have already been quite thoroughly listed and described,[1] and it is the aim of the present writer merely to present a few additional supplementary notes on fluorite from this locality, chiefly from the crystallographic viewpoint.

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[1] Giles, Albert W.; Minerals in the Niagara Limestone of Western New York, *Proc. Rochester Acad. Sci.*, **6**, 57-72, (1920). Whitlock, H. P.; New York Mineral Localities, *New York State Museum Bulletin* **70**, 1903.

Specimens of crystallized selenite, calcite, and dolomite, obtained from the Lockport dolomite strata in the old Erie canal excavation at Lockport, New York, many years ago, are now found in many of our best mineral collections. Fluorite however appears to have been seldom found there, and only in simple purple cubes. Fluorite is a far more common mineral at Rochester, where small crystals may readily be observed in the Guelph strata, especially where the latter have been more recently excavated, as along the new barge canal.

The fluorite crystals of Rochester are usually small cubes, probably never exceeding four or five cm. in diameter, with a color ranging from a deep, rich purple through light purple and blue tints to colorless; also, an extremely rare type with a bright green color and octahedral habit of crystallization has been found. A yellowish color is seen in some specimens, often caused by the presence of petroleum residues. A single crystal of fluorite usually represents all of the mineral in a cavity. It is notable that the majority of the purple cubes occur in association with rhombs of white dolomite and yellow scalenohedrons of calcite, the whole often encased in a fine quality cleavable selenite, which fills the balance of the cavity. The colorless, transparent cubes, on the other hand, have been most often found in cavities whose walls are lined with tiny drusy quartz crystals alone.

Detailed examination with the unaided eye and the hand lens at once demonstrates that the solid angles of the fresh, unweathered fluorite cubes are in very many cases modified, and often highly so. The modifying faces are small and bright, and sometimes occur in combinations of several forms on a single crystal. Study of a great many selected crystals has given the list of forms enumerated below, from which all doubtful and vicinal forms have been eliminated. The forms so far identified are as follows: *c* (001) common; *a* (013) uncommon, the usual tetrahexahedron, where one is present; **E* (023) rare; *e* (012) uncommon; *d* (011) rare, most often produced by etching; *m* (113) common, present on many crystals, alone and in combinations; *p* (111) uncommon; Γ (3.14.20) uncommon; Ξ (137) common, often relatively prominent and bright; *T* (2.6.15) uncommon; also a persistent vicinal tetrahexahedron at about 1° from *c* (001).

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* New form.

The following measurements serve to identify the new form:

| | Measured | | Calculated | |
|---|---|---|---|---|
| (230) | 33° 30′ | 90° 22′ | 33° 41′ | 90° 00′ |

Cleavage is perfect octahedral; twinning, on (111), is rare. Numerous examples among these fluorite crystals contain slender, blade-like negative crystal cavities, evidently an orthorhombic combination of pinacoids terminated by the base or a dome. These may have been celestite crystals. In one case a small amount of liquid or dried petroleum residue, with curved meniscus, can be seen within the negative crystal cavity. One group of small crystals show *a* (013) and *c* (001) in equal development. Microscopic examination shows that these crystals are filled with tiny cavities containing hydrocarbons, perhaps liquid; this may account for the large development of the tetrahexahedron.

Gypsum is readily removed by weathering from any exposed cavities, as cleavages of the selenite become beautifully etched when exposed to the weather during ordinary wet periods for two or three weeks. The fluorite crystals also are slowly dissolved, and those which have been exposed for a period of five years or more are found to be covered with etch figures in the form of tiny octahedral pits whose axes are parallel to the principal elements of the crystal; and additional rough faces, usually those of the dodecahedron, are formed by this etching.

## PROCEEDINGS OF SOCIETIES

### NEW YORK MINERALOGICAL CLUB

*Regular Monthly Meeting of October 8, 1924*

A regular monthly meeting of the New York Mineralogical Club was held in the East Assembly Room of the American Museum of Natural History on the evening of October 8th, at 8:15 P.M. In the temporary absence of the president and vice-president, the corresponding secretary, Mr. Roy M. Allen, occupied the chair. There was an attendance of 21 members.

The following names were submitted to the committee on membership: Mr. G. Arthur Cooper, Flushing, N. Y., and Mr. R. Norris Shreve, 50 East 41st Street, New York. The committee on the Scott Memorial resolution reported progress. The recording secretary, speaking for the committee on the Gratacap Memorial Tablet, reported the matter in the hands of the president. The treasurer, reporting on the finances of the Gratacap Tablet, stated that there was on hand a sum of $202.00 toward the cost of the tablet, and that $70.00 further was promised. He suggested that a Memorial Meeting of the Club be arranged at the time of the unveiling of the tablet, to which the friends and former associates of Curator Gratacap be invited.

The recording secretary called to the attention of the Club the recent death of Dr. Edmond O. Hovey, and spoke briefly on Dr. Hovey's life and work. At this point the president assumed the chair, and spoke more fully on Dr. Hovey, mentioning a number of incidents in his life. On a motion by Mr. Whitlock the following committee was appointed to draw up a fitting resolution on the death of Dr. Hovey: Messrs. Stanton, Manchester and Whitlock.

Mr. Stanton read a letter from Mr. Otto Pfordte in which he presented to the Club a copy of a recently published map of Green Lake, a glacial lake situated near Syracuse, N. Y. Dr. Kunz mentioned the visit of Dr. L. J. Spencer, of the British Museum, to New York, and spoke of his visit to Franklin Furnace, N. J., and to Dover, to inspect the Canfield Collection, on which occasion Mr. Charles W. Hoadley, representing the Club, acted as his guide. He also spoke of the Toronto meeting of the British Association for the Advancement of Science, which he attended. He then introduced the special topic for the evening's discussion, *A Symposium on the Minerals collected during the past Summer.*

Mr. Grenzig described trips to Franklin and one to Branchville, mentioning cleiophane, a massive nearly white rhodochrosite, apophyllite and sussexite from the former locality, and azurite from Ogdensburg. He also exhibited several fine terminated crystals of scolecite from Iceland, and crystallized albite from Branchville. Mr Grenzig also showed a number of specimens of New York City minerals, which he offered to present to the Club's collection. In accepting these a vote of thanks was tendered to Mr. Grenzig.

Mr. Stanton introduced a suite of specimens sent by Mr. Henry Fair illustrating the mineral occurrences in the basalt around Spokane, Washington. Conspicuous among these were some excellent specimens of sphaerosiderite. He also read a letter from Mr. Fair describing some of the older localities. Messrs. Manchester and R. M Allen described some recent finds among New York City minerals. Among these were malachite and garnet from 181st Street, some of the latter having been cut as gems, fifteen species including exceptional garnets from 225th Street, pyrrhotite, pyrite and tourmaline from Sheridan Ave. and 170th Street, and marcasite from 153rd Street. Mr. Manchester also found rose quartz from the new feldspar quarry at Bedford, N. Y.

Mr. Broadwell stated that 36 species had been found at Branchville on the occasion of the Club's trip on Decoration Day, and that he had personally collected 24 species, and Mr. Walther 26 species upon that trip. Dr. Kunz mentioned a flattened diamond crystal weighing 40.22 carats from Murfreesboro, Arkansas. Mr. Hoadley reported visiting 22 localities during the season. The most important finds included: datolite, roeblingite, hancockite, schallerite and chlorophoenicite from Franklin, the two last being new species; erythrite, uralite, apophyllite, chalcopyrite, magnesite and pyrite from French Creek, Pa.; and stilbite and apatite from Anthony's Nose, N. Y. He spoke highly of the possibilities of the last locality and urged that it be made the objective of the Club's field trip on election day. Mr. Hoadley also described his visit to Franklin Furnace with Dr. Spencer, and a subsequent call on Dr. Canfield at Dover.

Mr. Whitlock showed some interesting apatite crystals, several of which were from the collection of Mr. F. I. Allen. These have been examined by him, and have yielded five crystal forms new to apatite. In the subsequent discussion of the objective for the election day field trip, Mr. Griggs suggested Bedford as a promising locality. The matter was referred to the committee on excursions with power to act. HERBERT P. WHITLOCK, *Recording Secretary.*

## THE PHILADELPHIA MINERALOGICAL SOCIETY

*Academy of Natural Sciences, November 13, 1924*

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Mr. Vaux, in the chair. Twenty-six members and fourteen visitors were present.

Announcement was made of the prize winners in a contest for the best mineral collection conducted by the society among the students of the Northeast High School of Philadelphia.

Mr. Samuel G. Gordon addressed the society on "*The Minerals of Narsarsuk, Greenland,*" and described the work done at this locality by the Vaux-Academy expedition of 1923. The minerals are found in small pockets within a restricted area of augite-syenite near the border of a great batholith of nepheline-syenite. One pocket contained 24 minerals, representing nearly one-third of all the known elements. Some of the rarer minerals found were: arfvedsonite, aegirite, epididymite, catapleiite, parisite, cordylite, ancylite, elpidite, astrophyllite, narsarsukite and neptunite. Mr. Hoadley reported on trips to various Connecticut localities.

Mr. Gordon announced the results of investigations indicating trolleite to be identical with lazulite, chlorotile with mixite, and schoepite with becquerelite. By reorienting, so that the forms (001), (100), (010), (021), (101), and (102) of becquerelite become respectively (100), (010), (001), (205), (4.10.0) and (450) of schoepite, the axial ratios then became.

becquerelite, $a:b:c=0.432:1:0.874$
schoepite, $a:b:c=0.426:1:0.875$

HORACE R. BLANK, *Secretary*

## NEWARK MINERALOGICAL SOCIETY

The 68th regular meeting was held on November 2nd with President Walther presiding and fourteen members present; also two visitors. The minutes of the last meeting were read and approved.

The applications for membership of Dr. R. Norris Shreve and Miss F. P. Clayton were received and accepted. The treasurer reported a balance on hand of $40.47. The secretary reported a membership of 27 at the beginning of the year: 13 new applications received during the year, making a total of 40 members.

The following were elected to office for the coming year: President, Capt. T. I. Miller; Vice-president, Dr. Geo. F. Black; Secretary, Wm. H. Broadwell; Treasurer, H. M. Lehman.

Mr. Walther as speaker of the day, then presented his paper on "*Physical Properties as an Aid in the Identification of Minerals.*" The members exhibited a large assortment of specimens. Mr. Broadwell exhibited an unusual reprint of an ancient book, AGRICOLA DE RE METALLICA, said to be the first on the subject of mining and mineralogy. The original book bore the date 1556, and great interest was expressed in the facsimile. WM. H. BROADWELL, *Secretary.*

# NEW MINERALS: NEW SPECIES

## CLASS: SULFIDES. DIVISION: RS: $R_2S_3=4:1$.

### Goongarrite.

Edward S. Simpson: Goongarrite, a new mineral from Comet Vale, Western Australia. *J. Roy. Soc. West. Australia*, **10,** 65 (1924).

Name: From the locality, Lake *Goongarrie*, Western Australia.

Crystallographic Properties: Probably monoclinic. Some interfacial angles given.

Chemical Properties: A sulfide of lead and bismuth; 4PbS, $Bi_2S_3$. Analysis: Pb 54.26, ZnO 0.6, Fe 0.17, Ag 1.05, Bi 28.81, Sb 0.11, As nil, S 15.24, Se 0.24, Sum 99.94. Soluble in strong HCl; soluble in $HNO_3$ with separation of $PbSO_4$.

Physical Properties: Structure fibrous, sub-fibrous to platy; cleavage good. Sp. Gr. 7.29, H 3. Brittle.

Occurrence: Forms small irregular masses, plates and stringers in quartz with no other metallic sulfide. Gold is associated with it as well as its alteration products, bismutite, cerussite, and anglesite.

Discussion: Apparently a well defined sulfobismuthide of lead of the jordanite group.

W. F. Foshag

## CLASS: HALIDES. SUBCLASS: HYDROXYHALIDES

### Kempite.

Austin F. Rogers: Kempite, a new manganese mineral from California. *Am. J. Sci.*, **8,** 145-150 (1924).

Name: In honor of Prof. James Furman *Kemp*, Professor of Geology, Columbia University.

Chemical Properties: An oxychloride of manganese. $MnCl_2.3MnO_2.3H_2O$. Analysis: Mn 50.59, Cl 16.41, $H_2O$ 11.60, O (by diff.) 21.40. Total 100. (Recalcd. after deducting insol. material). In closed tube gives $H_2O$ with acid reaction and turns black. Soluble in $HNO_3$. Sol. in HCl with evolution of Cl.

Crystallographic Properties. Orthorhombic. $a:b:c=0.677.1:0.747$. Forms (011), (110), (121), (100), (010). Prismatic habit.

Physical and Optical Properties: Color emerald green. H. about 3 1/2. Sp. Gr. 2.94. Biaxial, negative. $\alpha=1.684$, $\beta=1.695$, $\gamma=1.698$. $a=\gamma$, $b=\beta$, $c=\alpha$. Plane of the optic axes parallel to (010).

Occurrence: With pyrochroite, hausmannite and rhodocrosite in the Alum Creek "Meteorite," a large mass of manganese ore, now consumed.

Discussion: This new mineral is similar in type of compound as well as in crystallography to the hydroxychloride of copper, atacamite and probably belongs in the atacamite group.

W. F. F.

## CLASS: PHOSPHATES, ETC. DIVISION: $R'':R''''':H_2O=10:2.7$.

### Chlorophoenicite.

William F. Foshag and R. B. Gage: Chlorophoenicite, a new mineral from Franklin Furnace, New Jersey. (Preliminary description). *J. Wash. Acad. Sci.*, **14,** 362 (1924).

Name: From *χλωρος*=green and *φοινικος*=purple red, in allusion to the property it possesses of changing from green in natural light to light purplish red in artificial light.

Chemical Properties: A hydroxy-arsenate of zinc and manganese, $10\,(Zn, Mn)\,O.\,As_2O_5.\,7H_2O$. Analysis: $H_2O$ 11.60, CaO 3.36, MgO 1.34, FeO 0.48, MnO 34.46, ZnO 29.72, $As_2O_5$ 19.24, Sum 100.24. In closed tube gives off water and turns black.

Crystallographic Properties: Monoclinic with habit like epidote.

Physical and Optical Properties: Color light grayish green in natural light but light purlish red in artificial light. Plane of the optic axes across the prismatic crystals. $2V$ large with dispersion $\rho>\nu$, strong. $\alpha=1.682$, $\beta=1.690$, $\gamma=1.697$.

Occurrence: With calcite, tephroite and leucophoenicite in cracks in franklinitezincite ore.

Discussion. The ratio of hydroxide to arsenate is larger than in any of the other well known arsenates. The formula may be written $R_3As_2O_8.7R(OH)_2$.

W. F. F.

## CLASS: PHOSPHATES, ETC. DIVISION: $R':R''':R'''''=1:2:1$.

### Swedenborgite

G. Aminoff: Ueber ein neues mineral von Langban (A new mineral from Langban). *Z. Krist.*, **60**, 262, (1924).

Name: In honor of Emanuel *Swedenborg.*

Chemical Properties: An antimonate of sodium and aluminum, $Na_2O.\,2Al_2O_3.Sb_2O_5$. Analysis. $Sb_2O_5$ 54.14, $P_2O_5$ 0.23, $Al_2O_3$ 34.72, CaO 0.94, MgO 0.52, $Na_2O$ 8.50, $K_2O$ 0.21, $H_2O$ 0.39, Sum 99.68. Insoluble in hydrochloric and sulphuric acids.

Crystallographic Properties: Hexagonal, prismatic. Forms (0001), $(10\bar{1}4)$, $(10\bar{1}3)$, $(10\bar{1}2)$, $(10\bar{1}1)$, $(20\bar{1}2)$, $(10\bar{1}0)$. $P_0=1.8832$, $c=2.8284$. $c:a=1.6309$.

Physical and Optical Properties: Colorless to wine yellow, transparent. H. 8. Cleavage 0001, distinct. Uniaxial, negative. $\omega_{Na}=1.7724$, $\epsilon_{Na}=1.7700$. Dispersion strong.

Occurrence: In the England stope at Langban in lenses of limestone with specular iron, richterite, manganophyllite, a berzeliite-like mineral and an unknown white hexagonal mineral.

Discussion. Aminoff points out a relationship to nordenskiöldine:

| | | |
|---|---|---|
| Swedenborgite | $Na(AlO)_2SbO_4$ | $c=1.6309$ |
| Nordenskiöldine | $Ca(BO)_2SnO_4$ | $c=1.6442$ |

W. F. F.

## CLASS: PHOSPHATES, ETC. DIVISION: $R'''':R''''':H_2O=2:1:X$.

### Vanoxite.

Frank L. Hess: New and known minerals from the Utah-Colorado carnotite region. *Bull. U. S. Geol. Survey*, **750**, 63 (1924).

Name: From *Van*adium *Ox*ide.

Crystallographic Properties: Crystals minute with occasional rhombic outline.

Chemical Properties: A hydrous vanadyl vanadate, $2V_2O_4.V_2O_5.\ 8H_2O$. Analyses: $V_2O_4$ 53.1-50.9, $V_2O_5$ 25.7-29.5, $UO_3$ 0.5-0.11, $H_2O$ 20.7-19.4. (Recalculated after deduction of impurities).

Physical and Optical Properties: Color black. Opaque, compact.

Occurrence: Found as a replacement of wood and as a cement in sandstone at the Jo Dandy and other mines, Paradox Valley, Montrose Co., Colorado. Associated with gypsum, pyrite, tyuymunite, limonite and sometimes pascoite.

Discussion: Apparently new but its nature does not permit the accurate determination of its composition or properties. Apparently differs from alaite in the amount of water, stage of oxidation of some of its vanadium and some of its physical properties. The name is an unfortunate choice since the mineral is probably not an oxide of vanadium but a vanadyl vanadate. W. F. F.

## CLASS: SILICATES. DIVISION: $RO:R_2O_5:SiO_2:H_2O=5:1:5:2$.

### Chapmanite.

T. L. Walker: Chapmanite, a new hydrous ferrous silicoantimonate, from South Lorrain, Ontario. *Contr. to Canadian Mineralogy*, p. 5,.(1924).

Name: In honor of the late Prof. E. J. Chapman, Professor of Geology, University of Toronto.

Chemical Properties: A hydrous silicoantimonate of ferrous iron, $5FeO.\ Sb_2O_5.\ 5SiO_2.2H_2O$. Analysis: FeO 33.91, Ni 0.36, Co 0.03, Cu 0.17, Bi 0.20, As 1.28, $Al_2O_3$ 0.28, $SiO_2$ 28.28, $Sb_2O_5$ 31.65, $H_2O$ 3.46. Sum 99.62.

Physical and Optical Properties: Finely divided, soft. Color green. Sp. Gr. 3.58. Optically negative (?). $2V$ small or moderate. $\alpha=1.85$, $\gamma=1.96$. $\gamma$ parallel to the length and $\alpha$ normal to a flat face.

Occurrence: At the Keeley Mine in South Lorrain near Cobalt, Ontario, intimately mixed with silver.

Discussion: Distinct from the other known silicoantimonate, långbanite, and not closely related to any other known mineral. W. F. F.

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## NOTES AND NEWS

### STROMEYERITE: YELLOW PINE MINE, BOULDER CO., COLORADO. WILLIAM P. HEADDEN, *Colorado Experiment Station.*

The physical properties of this sample are those usually given for the mineral except that it shows only a slight degree of iridescence. It forms a layer of varying thickness covering a mass of zinc blende and galena. The locality is new, so far as I know, although the mine is an old one. This sample was found by parties who were searching for new bodies of ore. Their efforts were a failure. My information is that only a small amount of this ore was found. The Colorado localities given in Dana's Mineralogy for this mineral are: The Yankee Girl Mine, Ouray County, and The Black Prince Mine, Summit County. These localities are old and the mines closed.

This sample is massive and apparently perfectly homogeneous, but it contains a considerable amount of zinc and lead. No zinc blende or galena could be detected in the material analyzed, even when broken into very small pieces. The composition is as follows:

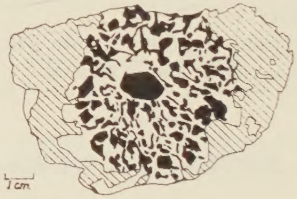
| | | | *Ratios* |
|---|---|---|---|
| Ag | 48.64 | .4509 | 1.98 |
| Zn | 3.28 | .0502 | |
| Pb | 1.53 | .0073 | |
| Cu | 30.64 | .4819 | |
| Fe | .20 | .0036 | |
| S | 16.23 | .5006 | 1.00 |
| | 100.52 | | |
| Specific gravity | 6.1271 | | |

### GRAPHIC INTERGROWTHS OF QUARTZ AND BLACK TOURMALINE FROM MAINE.—

WALTER H. NEWHOUSE AND EDW. F. HOLDEN. *Massachusetts Institute of Technology and University of Michigan.*

During the summer of 1922 the writers made a trip through the Maine gem district. The gem minerals mentally associated with that region were not at all abundant, for previous visitors had rather thoroughly collected them. Nevertheless some interesting specimens were seen, among them remarkable intergrowths of black tourmaline with quartz. These seemed worthy of a short description.

Bastin[1] briefly mentions such intergrowths as occurring at Auburn, Paris and Poland. Quartz-muscovite and the ordinary quartz-feldspar graphic intergrowths were also mentioned, and were seen on our trip. Lacroix[2] has figured a similar tourmaline-quartz intergrowth from Madagascar.



Tourmaline-quartz intergrowth. Black, tourmaline; white, quartz; shaded, feldspar. ½ natural size.

We noted these intergrowths at two localities, Mt. Apatite in Auburn, and Mt. Rubellite in Hebron. Those from Hebron were the better. The dark intergrowths are circular, up to 6 cm. in diameter, presenting a striking contrast to the creamy white feldspar-quartz rock in which they occur. The boundary between quartz-feldspar and quartz-tourmaline intergrowths is very abrupt. In the center of the latter intergrowths there is usually a large black crystal of tourmaline, about which are grouped smaller crystals, while anhedral quartz fills in the remaining space.

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[1] Edson S. Bastin. *U. S. Geol. Survey, Bull.* **445**, 54, 57, 69, 80, (1911).

[2] A. Lacroix. *Minéralogie de Madagascar.* I, plate 20, fig. 8, (1922).

The tourmaline crystals are so arranged that the *c*-axes are nearly parallel. Occasionally tourmaline crystals of an intermediate size are grouped at a distance from the large central crystal, like satellites. It would seem likely that the feldspar and quartz crystallized out first, followed by the quartz and tourmaline, the process ending in the formation of the large central crystal. The accompanying figure is a sketch of one of the intergrowths.

On invitation of the Departments of Geology and Mineralogy of Yale University, the next annual meeting of the Mineralogical Society of America will be held at New Haven, Connecticut, in conjunction with that of the Geological Society of America and other affiliated societies. The exact date has not been determined, but will be on or about December 29th.

The Field Museum of Natural History, Chicago, has been given a trust fund of $25,000 by Julius Rosenwald, of Chicago, to be used by the museum without restrictions.

The March issue of The American Mineralogist will contain the proceedings of the fifth annual meeting of the Mineralogical Society, held at Ithaca, New York, on December 31. The presidential address and short abstracts of all papers presented will be found in that issue.

Dr. Horace L. Wells, emeritus professor of chemistry at Yale University and for forty years on the faculty of the Sheffield Scientific School, died on December 19, in his seventieth year. Dr. Wells made many mineral analyses and "wellsite" was named in his honor.

Daniel S. Martin, a well known mineralogist and former professor of geology in the Rutgers Female College and in the College for Women at Columbia, S. C., died at Brooklyn, at the age of 83 years.

Professor W. A. Tarr of the University of Missouri and one of the recently elected Councilors of the Mineralogical Society of America, delivered at Cambridge, England, five lectures to the class of economic geology on the copper, lead and zinc deposits of the United States.

It has been officially announced that the metric system will be used exclusively in the Dutch East Indies, by which Amsterdam pounds and piculs will be abolished. Heretofore the two systems have been functioning side by side, but it is now believed that experience shows that the metric system is preferable.

The means for future production of oil from government reserves of coal and oil shale was the subject of a conference recently held at the Interior Department by technologists of the Navy, the Bureau of Mines and the Geological Survey. A research program to aid the commercial development of processes by which oil may be obtained from oil shales, lignite and other coal is being planned by the Bureau of Mines.

Dr. Felix Tannhauser, professor of mineralogy and geology at the Technische Hochschule and the University of Berlin, died on December 2.

After having heard representatives of the Geological Survey, the Bureau of Soils and others concerned, the Committee on Mines and Mining of the House of Representatives is expected to report favorably the Sheppard bill, authorizing an expenditure of $500,000 for prospecting and research looking to the development of domestic potash resources.

## ABSTRACTS

BAUXITE ASSOCIATED WITH SIDERITE. Ernest F. Burchard. *Bull. Geol. Soc. Am.*, **35,** 437-448 (1924).

A new bauxite field occurring as a belt of separate deposits 3 to 5 mi. wide and 150 miles long, extending thru 10 counties, has been found in N.E. Mississippi. Associated with the bauxite are lenticulat masses of siderite, 6 to 20 in. thick, which alter easily to limonite. A large proportion of the Miss. bauxite contains so much $Fe_2O_3$ and $SiO_2$ that it is considered low to medium grade compared with bauxite from other localities. $Al_2O_3$ (bulk) 35-45%; $Fe_2O_3$ 5-35%; $SiO_2$ 10-30%. W. F. H.

MINERALOGY AND PETROGRAPHY OF FOSSIL BONE. Austin F. Rogers. *Bull. Geol. Soc. Am.*, **35,** 535-556 (1924).

Silicified bone is exceedingly rare, only 3 were found among 300 examined. Fossil bones, generally, consist almost entirely of the amorphous mineral collophane, $3Ca_3(PO_4)_2.nCa(CO_3)(H_2O)_x$, which is also the main constituent of phosphate rock. *n* has the limiting values of 1 and 2 and x is also variable. Ca is partially replaced by Fe, Al, and Mg and $(CO_3)$ by F, O, and $(SO_4)$. Index of refraction, 1.573-1.621. The associated minerals (usually cavity fillings) include quartz, opal, chalcedony, calcite, dolomite, aragonite, barite, pyrite, dahllite and wavellite. W. F. H.

CONTACT METAMORPHISM AT BINGHAM, UTAH. Waldemar Lindgren. *Bull. Geol. Soc. Am.*, **35,** 507-534 (1924).

As a result of contact metamorphism, extending from a few hundred to 2000 feet from the igneous mass, the original siliceous limestone of the Yampa and Highland Boy formations, gained $SiO_2$, S, iron, magnesia, alumina and soda, while $CO_2$ and lime have been carried away. The metamorphism was accompanied by the introduction of $FeS_2$, $CuFeS_2$, and other sulfides, altho the main ore deposits were formed at a later stage. The volume of the limestone has remained approx. constant. W. F. H.

A NOTE ON THE LANCASTER GAP MINE, PENNSYLVANIA. T. C Phemister. *J. Geology*, **32,** 498-510 (1924).

The nickel deposits occur mostly at the contact of mica schist and amphibolite Ascending solutions, it is argued, formed biotite by the replacement of silicates. Later solutions carrying S, Fe, Cu, $CO_3$ and Ni reacted with the silicates and sulfides were produced. The biotite was especially susceptible to replacement. W. F. H.